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Evaluation of Oral Hygiene Status in Patients Using Clear Aligners Versus Fixed Orthodontic Appliances

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ABSTRACT

Background: Orthodontic appliances can adversely affect oral hygiene by promoting plaque accumulation and gingival inflammation. Fixed orthodontic appliances are associated with increased plaque-retentive areas, whereas clear aligners, being removable, may facilitate better oral hygiene maintenance.

Aim: To evaluate and compare the oral hygiene status in patients undergoing orthodontic treatment with clear aligners and fixed orthodontic appliances.

Materials and Methods:A comparative clinical study was conducted on 60 orthodontic patients divided into two groups: Group A comprised 30 patients treated with clear aligners, and Group B comprised 30 patients treated with fixed orthodontic appliances. Oral hygiene status was assessed using the Plaque Index (Silness and Löe) and Gingival Index (Löe and Silness). The collected data were statistically analyzed using the independent t-test.

Results: The mean plaque and gingival index scores were significantly lower in the clear aligner group compared to the fixed appliance group ($p < 0.05$), indicating superior oral hygiene and gingival health among aligner-treated patients.

Conclusion: Patients treated with clear aligners demonstrated better oral hygiene status than those treated with fixed orthodontic appliances. Clear aligners may therefore be considered a favorable treatment option for patients where maintenance of periodontal health is a priority.

Introduction

Orthodontic treatment plays a vital role in improving dental esthetics, function, and overall oral health. However, the presence of orthodontic appliances often creates challenges in maintaining adequate oral hygiene. Fixed orthodontic appliances such as brackets, bands, and archwires provide plaque-retentive niches, increasing the risk of plaque accumulation, gingivitis, and enamel demineralization.

Clear aligner therapy has gained popularity in recent years due to its esthetic appeal, comfort, and removability. The ability to remove aligners during eating and oral hygiene

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procedures may contribute to improved plaque control and gingival health. Despite these advantages, limited comparative clinical evidence exists regarding oral hygiene status in patients using clear aligners versus fixed orthodontic appliances, particularly in the Indian population.

Therefore, the present study was undertaken to evaluate and compare the oral hygiene status of patients undergoing orthodontic treatment with clear aligners and fixed orthodontic appliances.

Materials and Methods

Study Design and Setting: A comparative clinical study was conducted in the Department of Orthodontics after obtaining approval from the institutional ethical committee. Written informed consent was obtained from all participants.

Sample Size and Grouping: A total of 60 patients undergoing orthodontic treatment for a minimum duration of three months were included in the study and divided into two groups:

Group A: 30 patients treated with clear aligners

Group B: 30 patients treated with fixed orthodontic appliances

Inclusion Criteria

1 Patients aged 15–35 years
2 Undergoing orthodontic treatment for at least three months
3 Systemically healthy individuals
4 Patients willing to participate in the study

Exclusion Criteria

1 Patients with systemic diseases affecting periodontal health
2 History of periodontal therapy within the last six months
3 Smokers or tobacco users
4 Patients with poor compliance with oral hygiene instructions

Clinical Examination and Indices Used: All clinical examinations were performed by a single calibrated examiner under adequate illumination.

Plaque Index (Silness and Löe, 1964): The plaque index was used to assess the thickness of plaque at the gingival margin. Four surfaces of each tooth were examined and scored from 0 to 3, where 0 indicated the absence of plaque and 3 indicated heavy plaque accumulation. The final plaque score was calculated as the mean score of all examined surfaces.

Gingival Index (Löe and Silness, 1963): The gingival index was used to assess gingival inflammation based on color, consistency, and bleeding on probing. Gingiva was scored from 0 to 3, with higher scores indicating increased severity of inflammation. The final gingival score was calculated as the mean of all examined sites.

Statistical Analysis: Data were analyzed using SPSS software. Mean and standard deviation were calculated for both indices. Intergroup comparison was performed using the independent t-test. A p-value of < 0.05 was considered statistically significant.

Results

Table 1 shows the comparison of plaque index scores between patients treated with clear aligners and those treated with fixed orthodontic appliances. The mean plaque index score in the clear aligner group was 0.82 ± 0.21, whereas a higher mean score of 1.46 ± 0.34 was observed in the fixed appliance group. The difference between the two groups was found to be statistically significant ($p < 0.05$), indicating that patients using clear aligners had significantly lower plaque accumulation compared to patients with fixed orthodontic appliances.

Table 2 presents the comparison of gingival index scores between the two study groups. Patients treated with clear aligners demonstrated a mean gingival index score of 0.74 ± 0.19, while those with fixed orthodontic appliances showed a higher mean score of 1.38 ± 0.29. This difference was also statistically significant ($p < 0.05$), suggesting better gingival health and reduced gingival inflammation in patients using clear aligners.

Overall, the findings from both tables indicate that clear aligner therapy is associated with improved oral hygiene status and better gingival health when compared to fixed orthodontic appliance therapy.

Table 1: Comparison of Plaque Index Scores Between the Two Groups

Group	n	Mean ± SD	p-value
Clear aligners	30	0.82 ± 0.21	< 0.05*
Fixed appliances	39	1.46 ± 0.34	

*Significant

Table 2: Comparison of Gingival Index Scores Between the Two Groups

Group	n	Mean ± SD	p-value
Clear aligners	30	0.74 ± 0.19	< 0.05*
Fixed appliances	39	1.38 ± 0.29	

Discussion

Maintenance of oral hygiene during orthodontic treatment is a critical factor in preventing plaque-induced gingival inflammation and subsequent periodontal complications. The presence of fixed orthodontic appliances such as brackets, bands, and archwires creates multiple plaque-retentive areas that hinder effective mechanical plaque removal. The complex design of fixed appliances makes routine oral hygiene procedures more challenging, thereby increasing the risk of plaque accumulation, gingivitis, and periodontal tissue breakdown if adequate oral hygiene is not maintained. In the present study, patients treated with clear aligners demonstrated significantly lower plaque index and gingival index scores compared to those treated with fixed orthodontic appliances. This finding may be attributed to the removable nature of clear aligners, which allows patients to perform routine oral hygiene practices such as tooth brushing and interdental cleaning without obstruction. The ability to remove aligners during meals and oral hygiene procedures facilitates better plaque control and reduces gingival inflammation.

The results of this study are in agreement with previous investigations that have reported improved periodontal parameters in patients undergoing clear aligner therapy when compared to those receiving fixed orthodontic treatment. Several authors have suggested that aligner-treated patients exhibit better plaque control and gingival health due to easier access to tooth surfaces and reduced plaque retention. Nevertheless, it is important to acknowledge that patient motivation, oral hygiene awareness, and compliance with recommended oral hygiene instructions play a pivotal role in maintaining periodontal health, regardless of the orthodontic appliance used. Therefore, continuous reinforcement of oral hygiene instructions remains essential for all orthodontic patients to minimize periodontal complications during treatment.

Conclusion

Within the limitations of the present study, it can be concluded that patients treated with clear aligners exhibited significantly better oral hygiene status and gingival health compared to patients treated with fixed orthodontic appliances. Clear aligners may be considered a favorable orthodontic treatment option for patients in whom the maintenance of periodontal health is a major concern.

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